Appendix A

Growth Targets

King County 2001-2022 Household and Employment Targets						
Subareas	Household Target	Housing Capacity in PAA*	PAA HH Target	Job Target	Job Capacity in PAA*	PAA Job Target
South King County						
Algona	298			108		
Auburn	5,928	2,635	926	6,079	252	252
Black Diamond	1,099			2,525		
Burien	1,552			1,712		
Covington	1,173			900		
Des Moines	1,576	5	2	1,695		
Federal Way	6,188	3,754	1,320	7,481	134	134
Kent	4,284	1,763	619	11,500	44	44
Milton	50	106	37	1,054		
Maple Valley	300			804		
Normandy Park	100			67		
Pacific	996	127	45	108		
Renton	6,198	5,622	1,976	27,597	458	458
SeaTac	4,478	14	5	9,288	496	496
Tukwila	3,200	13	5	16,000	497	497
Unincorp King County	4,935			2,582	701	701
Total	**42,355**	**14,039**	**4,935**	**89,500**	**2,582**	**2,582**
East King County						
Beaux Arts Village	3			-		
Bellevue	10,117	184	178	40,000	27	27
Bothell	1,751	603	584	2,000	174	174
Clyde Hill	21			-		
Hunts Point	1			-		
Issaquah	3,993	827	802	14,000	1	1
Kenmore	2,325			2,800		
Kirkland	5,480	770	747	8,800	221	221
Medina	31			-		
Mercer Island	1,437			800		
Newcastle	863	1	1	500		
Redmond	9,083	402	390	21,760	21	21
Sammamish	3,842			1,230		
Woodinville	1,869			2,000		
Yarrow Point	28			-		
Unincorp King County	6,801	**4222	**4099	4,637	**4193	**4193
Total	**47,645**	**7,009**	**6,801**	**98,527**	**4,637**	**4,637**
Sea-Shore						
Lake Forest Park	538			455		
Seattle	51,510			92,083		
Shoreline	2,651			2,618		
Unincorp King County***	1,670	1,670	1,670	694	1,544	694
Total	**56,369**	**1,670**	**1,670**	**95,850**	**1,544**	**694**
Rural Cities*						
Carnation	246			75		
Duvall	1,037			1,125		
Enumclaw	1,927			1,125		
North Bend	636			1,125		
Skykomish	20			-		
Snoqualmie	1,697			1,800		
Total	**5,563**			**5,250**		
King County Total	**151,932**			**289,127**		

*PAA: Potential Annexation Area in Unincorporated King County Urban Area; **Bear Creek UPD; ***North Highline

****The Rural Cities' targets are for the current city limits and rural expansion area for each city. Thus the methodology for adjusting targets as annexations occur is not applicable to the rural cities.

Editor's Note: Source for 2001 housing and job capacity figures for PAAs is the 2002 King County Buildable Lands evaluation. Subarea unincorporated targets were allocated to PAAs based on proportional capacity.

Appendix B

City and State Projects

CITY AND STATE PROJECTS

Project Name	From	To	Description	Jurisdiction	County
Auburn Way NE	2nd St NE	4th St NE	Widen to 5 lanes	Auburn	King County
M St NE	E Main	8th St NE	Widen to 5 lanes	Auburn	King County
M St SE	E Main	Auburn Way S	Widen to 4 lanes	Auburn	King County
S 277th St	Auburn Way N	Green River	Widen to 5 lanes	Auburn	King County
S 277th Street	SR-181	SR-167	Widen to 4 lanes	Auburn	King County
148th Ave SE	SE 24th St	I-90 WB on ramp	Add SB lane from SE 24 ST to the WB I-90 on-ramp	Bellevue	King County
Bellevue Way	South Bellevue P & R	I-90	Add HOV lanes	Bellevue	King County
Coal Creek Pkwy	I-405	Newport Way	Widen to 5 lanes	Bellevue	King County
Factoria Blvd	SE 36th St	SE 38th St	Construct SB Lane on 128TH from 36TH to 38TH	Bellevue	King County
Richards Road	SE 28th St	Lake Hill Connector	Widen to 4-5 lanes	Bellevue	King County
Ambaum Blvd SW	SW 128th St	SW 148th St	Widen to 5 lanes	Burien	King County
SR 99	S 216th St	Kent-Des Moines Road	Add HOV lanes	Des Moines	King County
SR-410	244th Ave SE	Enumclaw ECL	Widen to 3 lanes	Enumclaw	King County
16th Ave S	SR-99	SR-18	Add HOV lanes	Federal Way	King County
1st Ave S	S 348th St	S 356th St	Widen to 5 lanes	Federal Way	King County
1st Ave/Wy S	S 320th St	S 348th St	Widen to 6 lanes	Federal Way	King County
21st Ave SW	SW 344th St	SW 356th St	Widen to 5 lanes	Federal Way	King County
23rd Ave S	S 317th St	S 324th St	Widen to 5 lanes	Federal Way	King County
Military Rd S	S 288th St	S 304th St	Widen to 5 lanes	Federal Way	King County
S 288th St	18th Ave S	Military Rd	Add 1 GP lane in each direction	Federal Way	King County
S 320th St	1st Ave S	SR 99	Add HOV lanes	Federal Way	King County
S 336th / S 340th St	26th Pl SW	Hoyt Rd SW	Widen to 5 lanes	Federal Way	King County
S 336th/S 348th St	9th Ave S	13th Pl S	Add 1 GP lane in each direction	Federal Way	King County
S 336th/S 348th St	1st Ave S	21st Ave SW	Add 1 GP lane in each direction	Federal Way	King County
S 348th St	9th Ave S	SR 99	Add HOV lanes	Federal Way	King County

Project Name	From	To	Description	Jurisdiction	County
S 348th St	1st Ave S	9th Ave S	Add HOV lanes	Federal Way	King County
S 356th St	SR 99	SR 161	Widen to 3 lanes	Federal Way	King County
S 356th St	21st Ave S	SR-99	Widen to 5 lanes	Federal Way	King County
SR 161	SR-18	S 352nd St	Add HOV lanes	Federal Way	King County
SR 99	S 312th St	S 324th St	Add HOV lanes	Federal Way	King County
SR 99	S 284TH ST	SR 509	Add HOV lanes	Federal Way	King County
SR 99	SR 509	S 312th St	Add HOV lanes	Federal Way	King County
SR 99	S 324th St	S 340th St	Add HOV lanes	Federal Way	King County
SR 99	S 340th St	S 356th St	Add HOV lanes, 2-way left-turn lane	Federal Way	King County
SR 99	S 312th St	S 324th St	Construct HOV lanes	Federal Way	King County
E Lake Sammamish Pkwy	SE 56th St	I-90	Widen to 5 lanes	Issaquah	King County
Issaquah bypass	Front St	I-90	Construct new 5 lane arterial	Issaquah	King County
Newport Way	W. Sunset Wy	NW Maple St	Widen to 3 lanes	Issaquah	King County
NW Maple St	SR 900	SE Newport Way	Extend NW Maple 650 ft from SR-900 to Newport Way, 5 lanes	Issaquah	King County
SE Newport Wy	Maple St extension	SE 54th St	Widen to 3 lanes	Issaquah	King County
SE Newport Wy	SR-900	SE 54th St	Widen to 3 lanes	Issaquah	King County
68th Ave NE	NE 175 St	NE 185 St	Widen to 6 lanes	Kenmore	King County
68th Ave NE	N 175th St	Samm River Bridge	Add 1 NB GP lane	Kenmore	King County
132nd Ave SE	SE 272ND ST	SE 256TH ST	Widen to 5 lanes	Kent	King County
132nd Ave SE	SE 240th St	SE 256th St	Widen to 3 lanes	Kent	King County
S 196th/S 200th St	SR-181	E Valley Hwy	Provide 5-lane roadway	Kent	King County
S 208th St	SR-167	108th Ave SE	Widen to 5 lanes	Kent	King County
SE 192nd St Corridor	SR 167 Bridge	Talbot Rd	Build new 5-lane arterial	Kent	King County
SR 99	Kent-Des Moines Road	South 252nd Street	Add HOV lanes	Kent	King County
SR 99	South 252nd Street	South 272nd Street	Add HOV lanes	Kent	King County

Project Name	From	To	Description	Jurisdiction	County
W Valley Hwy	Hawley Rd	S 272 St	Widen to 5 lanes	Kent	King County
W Valley Hwy	James Street	Green River Bridge	Widen to seven lanes (two general purpose lanes, and one HOV lane in each direction, plus turn lanes) from Harrison St to SR-516, and four lanes S to the Green River Bridge	Kent	King County
124th Ave NE	NE 85th St	NE 124th St	Widen to 3 lanes	Kirkland	King County
NE 124th St	116th Ave NE	132nd Pl NE	New HOV lanes	Kirkland	King County
SR 169	SE 231 St	Wax Rd	Widen to 7 lanes	Maple Valley	King County
SR 169	SE 240 St	SE 253 St	Widen to 5 lanes	Maple Valley	King County
Newcastle Road/Lakemont Blvd	Coal Creek Parkway	164th Way SE	Widen to 3 lanes	Newcastle	King County
Avondale Rd	Novelty Hill Rd	Avondale Way	Add SB HOV lane	Redmond	King County
Bel-Red Rd	NE 30th ST	NE 40th ST	Widen to 5 lanes	Redmond	King County
East Lake Sammamish Pkwy	Redmond Way	187th AVE NE	Widen to 4 lanes	Redmond	King County
Redmond Way	148th Ave NE	I-405	Construct HOV lanes	Redmond	King County
Redmond-Woodinville Rd	160TH AVE NE	NE 124th ST	Widen to 5 lanes	Redmond	King County
Union Hill Road	Avondale Rd	178th Pl NE	Widen to 6 lanes	Redmond	King County
W Lk Sammamish Pkwy	Leary Way	SR-520	Widen to 5 lanes	Redmond	King County
W. Lk. Sammamish Pkwy. NE	Marymoor Park Entrance	NE 51st St	Widen roadway from 2 to 4 lanes	Redmond	King County
Duvall Ave NE	NE 4th St	NE 25th Ct	Widen to 5 lanes	Renton	King County
Oakesdale Ave SW	Monster Rd	SR 900	Widen to 5 lanes	Renton	King County
Park Dr-Sunset Blvd	Garden Ave	I-405	Add EB HOV lane	Renton	King County
SW 27th St	SR-167	SR 181	Construct HOV lanes on SW 27 St, and extend arterial to Strander Blvd	Renton	King County
228th Ave SE	SE 8th St	NE 4th St	Widen to 5 lanes	Sammamish	King County
244th Ave NE	SE 8th Street	Just s/o SR-202	Provide continuous 2-lane arterial	Sammamish	King County
Sahalee Way NE	NE 8th	NE 37th	Widen to 5 lanes	Sammamish	King County

CITY AND STATE PROJECTS

Project Name	From	To	Description	Jurisdiction	County
Sahalee Way NE	NE 37th	SR 202	Widen to 5 lanes	Sammamish	King County
28th/24th Ave S	S 188th St	S 216th St	Build new 5-lane road	Seatac	King County
International Blvd	S 152nd St	S 170th St	Widen to 6 lanes with turn channelization	Seatac	King County
International Blvd	S 200th Street	S 216th Street	Widen to 7 lanes	Seatac	King County
S 154th St	SR 518	24th Ave S	Widen to 4 lanes	Seatac	King County
S 188th St	16th Ave S	Des Moines Memorial Drive	Widen to 6 lanes	Seatac	King County
S 200th St	SR 509	Des Moines Memorial Drive	Widen to 3 lanes	Seatac	King County
South Airport Link	28th Ave S	S 188th St	New construction	Seatac	King County
Mercer Street Corridor	Queen Anne Ave	I-5	Convert to 2-way 4-6 lane road	Seattle	King County
Valley Street	Queen Anne Ave	I-5	Convert to 2-way 2-lane road	Seattle	King County
I-5/NE 185th St			Add HOV direct access ramp	Shoreline	King County
SR 99	N 205th St	N 145th St	Widen to 7 lanes for HOV	Shoreline	King County
I-405 @ NE 128th St			I-405 HOV direct access at NE 128th	Sound Transit	King County
I-405 @ NE 8th St			New HOV-access IC	Sound Transit	King County
E Marginal Way	Boeing Access Road	S 112th St	Widen to 3 lanes	Tukwila	King County
I-405	SR-522	I-5 Tukwila	Add 2 GP lanes in each direction	WSDOT	King County
I-405 @ NE 132nd St			Add half-diamond IC	WSDOT	King County
I-5	N 175th St	N 205th St	Add 1 NB lane	WSDOT	King County
I-5	Pierce CL	Kent	Complete 2-way HOV lanes	WSDOT	King County
I-5	Airport / Industrial Way Interchange Vicinity		HOV direct access to Industrial Way and the E-3 Busway	WSDOT	King County
I-5/SR-18/SR-161 Triangle			Connect SR-161 directly to I-5/SR-18	WSDOT	King County
I-90	Eastgate	Issaquah	Extend HOV lanes to Front Street and add auxiliary lanes from Eastgate to Front Street.	WSDOT	King County
I-90	I-5	I-405	Add one lane HOV each direction	WSDOT	King County
NE 85th St	148th Ave NE	Kirkland Way	Add HOV lanes	WSDOT	King County

CITY AND STATE PROJECTS

Project Name	From	To	Description	Jurisdiction	County
SR 161	Jovita Blvd	S 360th St	Widen to 5 lanes	WSDOT	King County
SR 167	15th St NW	County Line	Add HOV lanes	WSDOT	King County
SR 167	I-405	S 180th St	Add 2 lanes in each direction	WSDOT	King County
SR 167@ SW 27th St			HOV Direct Access Ramps at SW 27th St.	WSDOT	King County
SR 169	140th Way SE	I-405	Add HOV lanes	WSDOT	King County
SR 169	Black Diamond NCL	SR 516	Widen to 5 lanes	WSDOT	King County
SR 169	SR 516	SE Jones Road	Widen to 4 lanes	WSDOT	King County
SR 18	I-5 I/C	SR 164 I/C	Add a WB truck climbing lane from SR 167 to I-5	WSDOT	King County
SR 18	Maple Valley	I-90	Widen to 4 lanes	WSDOT	King County
SR 202	SR 522	NE 145th St./148th Ave NE	Widen to 5 lanes	WSDOT	King County
SR 202	E Lk Samm Pky	Sahalee Way	Widen to 5 lanes	WSDOT	King County
SR 509/I-5	S 188th Way	S 320th St	Extend SR 509 (4 GP + 2 HOV) to I-5 @ SW 210th, add 1 GP each way on I-5 from S 204th St to S 320th St	WSDOT	King County
SR 516	SR 18	SR 169	Widen to 5 lanes	WSDOT	King County
SR 518	SR 518/SR 509 I/C	I-5	Add GP Lanes each way. I/C improvements	WSDOT	King County
SR 519 Extenstion	I-90	1st Ave S	Extend freeway around ballpark	WSDOT	King County
SR 520	W Lake Sammamish Parkway	Avondale Road	Widen to 4 lanes	WSDOT	King County
SR 520	I-405	I-5	Add 1 HOV lane in each direction. Replace SR 520 bridge	WSDOT	King County
SR 520	W Lk Sammamish Pkwy	SR-202	Add 2-way HOV lanes	WSDOT	King County
SR 522	96th Ave NE	Woodinville	Realign SR-522 through Bothell. Complete full diamond I/C @ NE 195th St	WSDOT	King County
SR 900	I-90	SE 78th St St	Widen to 4 lanes	WSDOT	King County
SR 99	S 284th St	S 272nd St	Add 2-way Business, Access and Transit (BAT) lanes	WSDOT	King County
SR 99 (Pacific Highway South)	S 348th St	S 188th St	Provide continuous HOV lanes	WSDOT	King County
8th St E	E Valley Hwy E	W Valley Hwy	Widen to 5 lanes	Pierce County	Pierce County

Project Name	From	To	Description	Jurisdiction	County
Lake Tapps Pkwy E	182nd Ave E	East Valley Hwy	Extend arterial from EVH to 182nd & widen to 4/5 lanes	Pierce County	Pierce County
Valley Ave E/70th Ave E	Freeman Rd E	20th St E	Widen to 5 lanes	Pierce County	Pierce County
SR-410	SR-167	Bonney Lake	Add 1 lane in each direction + EB hillclimb lane	Sumner	Pierce County
Norpoint Way	49th Ave NE	29th St NE	Provide 3-lane roadway	Tacoma	Pierce County
I-5	DuPont Rd U-xing	Fort Lewis Rd	Add HOV lanes in both directions, and NB GP lane	WSDOT	Pierce County
I-5	Fort Lewis Rd	Gravelly Lake Dr U-xing	Add HOV lane in both directions	WSDOT	Pierce County
I-5	Gravelly Lake Dr U-xing	Carlyle Rd U-xing	Add SB HOV lane & convert NB GP lane to HOV	WSDOT	Pierce County
I-5	Carlyle Rd U-xing	Pierce CL	Add HOV lanes in each direction	WSDOT	Pierce County
SR-16	I-5	SR-302	Add HOV lanes in each direction	WSDOT	Pierce County
SR-161	Jovita Blvd	36th St	Widen to 5 lanes	WSDOT	Pierce County
SR-161	176th St	234th St	Widen to 5 lanes	WSDOT	Pierce County
SR-167	I-5	Puyallup	Build new six-lane freeway (2 GP + 1 HOV each direction)	WSDOT	Pierce County
SR-167	SR-18	SR-161	Add HOV lanes in each direction	WSDOT	Pierce County
SR-167	I-5	Port of Tacoma	Build new four-lane freeway	WSDOT	Pierce County
SR-167 @ 24th Ave E			Build new interchange	WSDOT	Pierce County
SR-410	214th	234th	Add 1 lane in each direction	WSDOT	Pierce County
SR-410	214th Ave E	Park Ave Wy	Widen to 4 lanes	WSDOT	Pierce County
I-405	SR-522	I-5 Swamp Creek	Add 2 GP lanes in each direction	WSDOT	Snohomish County
I-5	SR-526	SR-2	Add HOV lanes	WSDOT	Snohomish County
I-5	44th Ave W	220th St SW	Add NB auxiliary lane	WSDOT	Snohomish County
I-5	SR-2	SR-528	Add 1 HOV lane in each direction	WSDOT	Snohomish County
SR-2	SR-522	City of Monroe ECL	Add new 2-lane bypass road	WSDOT	Snohomish County
SR-2	I-5	SR-204	Add 1 Hov lane in each direction	WSDOT	Snohomish County
SR-2	City of Monroe ECL	City of Sultan WCL	Widen to 4 lanes	WSDOT	Snohomish County
SR-2	City of Sultan WCL	Fir Rd (near Proctor Creek)	Widen to 4 lanes	WSDOT	Snohomish County

CITY AND STATE PROJECTS

Project Name	From	To	Description	Jurisdiction	County
SR-522	Snohomish River	SR-2	Widen to 4 lanes	WSDOT	Snohomish County
SR-522	Paradise Lake Rd	Snohomish River	Widen to 4 lanes	WSDOT	Snohomish County
SR-524	I-5	SR-527	Widen to 5 lanes	WSDOT	Snohomish County
SR-527	SR-524	SE 228th St	Add HOV lanes	WSDOT	Snohomish County
SR-9	SR-522	176th St E	Widen to 5 lanes	WSDOT	Snohomish County
SR-99	SR-104	204th	Add 1 HOV lane in each direction	WSDOT	Snohomish County

Appendix C

Priority Processes

Capacity
HAL / HARS
Bridges
Short-Span Bridges
Guardrail
Traffic Signals
Pedestrian
ITS
Vulnerable Road Segments
Small-Scale Operational Road and Intersection

King County Road Services Division
PROJECT PRIORITY PROCESSES

CAPACITY NEEDS

Forecast travel information was used to identify future capacity needs and potential improvements. The travel forecasting model was developed by King County DOT staff using EMME/2 travel demand forecasting modeling software.

The model was calibrated to base year 2000 conditions using 2000 census data, existing roadway information, and empirical traffic count data. Detailed documentation of this model resides in the offices of the King County Department of Transportation, Roads Services Division.

A forecast year of 2022 was chosen consistent with the land use element of the comprehensive plan as required by state growth management legislation (RCW36.70A.070(6)). The model was run with regionally-adopted, 2022 target land use data for population and employment distributed to the model's zonal system. Growth targets and land use assumptions are included in Appendix A of this document. The model road network was developed to represent existing conditions plus a limited number of capacity projects that were considered committed for development and therefore certain to be in place by 2022. The Washington State Department of Transportation's 20-year list of transportation improvements to the state highway system was included in the network as were city projects that were listed in the 20-year time horizon of the regional plan, Destination 2030. City and state projects are listed in Appendix B.

By forecasting future year travel demand on a roadway network comprised of only existing and committed projects, it is possible to highlight areas that lack the capacity needed to accommodate the travel demand associated with the target year. This capacity needs information was identified by analyzing model results using forecast traffic volumes and forecast ratios of traffic volumes to roadway capacity.

Once the areas of forecast needs were identified, additional capacity was coded into the network to represent projects that might accommodate those needs. The model was run again using 2022 land use data. The results were analyzed using forecast traffic volumes, forecast ratios of traffic volumes to roadway capacity, and existing traffic count data. Additional adjustments were made to model network capacity to optimize performance. This process was repeated several times to identify the best set of capacity projects for meeting forecast needs based on the assumptions and conditions represented in the model.

The resulting needs represents the network capacity increases added to the final or optimum model run. This list represents the roadway capacity needs for 2022 assuming the regionally-adopted land use forecasts for population, households, and employment used to develop the land use component of the King County Comprehensive Plan 2004. All needs identified through this process are included in the needs list section of this document. Needs are also shown on maps included in Section III.

Since the capacity needs clearly exceeded available revenues, a priority scoring methodology was developed to help balance needs with available revenue. This methodology incorporated existing, empirical data; forecast data for 2022 without an improved roadway network; and forecast data for 2022 with an improved roadway network. The following data elements were collected, calculated, and scored:

- Average weekday traffic
- Existing traffic volume to roadway capacity ratios
- 2022 forecast volume to capacity ratios (without capacity improvement)
- 2022 forecast traffic volumes with capacity improvements
- Ratio between 2022 traffic volumes to roadway capacity for the unimproved network compared with the volume to capacity ratio for the improved network
- Arterial Classification of the project need

A description of this scoring system is included in the following table.

Priority Scoring for Capacity Projects

EXISTING Average Daily Traffic (ADT) for project
5 groupings based on magnitude of ADT – from Count Station locations

ADT Value	**Score**
>20,000	5
15,000 – 20000	4
10,000 – 15,000	3
5,000 – 10,000	2
<5,000	1

EXISTING Volume to Capacity Ratio (V/C) problem in 2000 – from the model
5 groupings based on severity of V/C

V/C Value	**Score**
>1.2	5
1.0 – 1.2	4
8. – 1.0	3
.6 - .8	2
<.6	1

Yr 2022 V/C problem without improvements
5 groups rated on severity of V/C problem

V/C Value	**Score**
>1.4	5
1.2 – 1.4	4
1.0 – 1.2	3
.6 – 1.0	2
<.6	1

Year 2022 ADT with final recommended improvements

ADT Value	Score
>40,000	5
30,000 to 40,000	4
20,000 to 30,000	3
10,000 to 20,000	2
<10,000	1

Year 2022 Improvement in V/C, Recommended Improvement verses no action

Value	Score
> .6 V/C change	5
.5 to .6 V/C change	4
.4 to .5 change	3
.3 to .4 V/C ratio	2
.2 to .3 V/C ratio	1

SYSTEM-Level ratings

Arterial Classification

Value	Score
Principal	3
Minor	2
Collector	1
Local	0

FINAL SCORES AND GROUPING

Score 27 to 24 = High Priority Group
Score 23 to 20 = Medium Priority Group
Score 19 and below = Low Priority Group

NON-CAPACITY NEEDS

Non-capacity needs are prioritized by groups of like needs. Existing prioritization processes have been developed either in-house or by consultants for various categories including bridge, guardrail, high accident location, traffic signals, and others.

Existing prioritization processes used to develop the TNR are summarized below.

HIGH ACCIDENT LOCATION (HAL) AND HIGH ACCIDENT ROAD SEGMENT (HARS) NEEDS

In 2002-2003 the King County Department of Transportation list of prioritized High Accident Location (HAL) and High Accident Road Segment (HARS) Needs was updated. The first step in this process was to develop a list of candidate HAL and HARS locations for review and analysis. An initial list was compiled based on accident data from the three-year period 1998-2000. The list was made up of locations that had eight or more recorded accidents in the three-year period.

Certain locations were eliminated from consideration for inclusion in the final list of HAL and HARS locations and needs. These include:

- Locations where recent improvements were judged likely to have a significant effect on the predominant accident patterns were omitted as were locations slated for near-term improvements judged likely to have a significant effect on the predominant accident patterns.
- Locations requiring additional data or analysis were identified and eliminated.
- Any locations that had been recently annexed by other jurisdictions were excluded.
- Sites with no clear accident pattern and no noted deficiencies were excluded.
- Several locations have accident rates considered normal for their ADT. This is a result of their being selected based on the number of accidents in a 3-year period as opposed to accident rate. Sites with normal accident rates, no clear accident pattern, and no noted deficiencies were excluded.
- A few locations were eliminated because the only countermeasures that could be determined were deemed infeasible based upon their impact on traffic flow.

Relevant data were collected for each HAL and HARS location. Field trips were made to collect site-specific data. Site diagrams were sketched, and sites were photographed. This information was added to traffic volume data and accident data from King County's database and was used in the subsequent location-specific analysis. Accident data were used to identify predominant accident patterns.

Although each HAL and HARS location is unique, certain accident patterns are indicative of site deficiencies that can be addressed by specific countermeasures. Countermeasures are improvements that address the accident patterns at a given location. The purpose of a countermeasure is to reduce the occurrence of accidents. There is a broad range of

countermeasures, with approaches ranging from changing roadway geometrics to altering traffic signal timing.

Countermeasures were developed for each of King County's HAL and HARS locations based on predominant accident patterns, field observations, County practices, and the experience of the review team.
General assumptions were made based on average daily traffic (ADT) as to the general suitability of certain countermeasures such as the installation of new signals and left-turn channelization.

Although safety is a primary objective when developing countermeasures, other factors, such as level of service impacts, must be considered. Consideration also was given to the County's standard practices and procedures. County practices deemed applicable to the countermeasure selection process are:

- At signalized intersections, the use of split phasing is discouraged.
- Where no left-turn phasing exists, County practice is generally to first implement protected/permissive left-turn phasing prior to exclusive protected left-turn phasing.
- Where advance-warning signs already exist and accidents still occur, the next step is to install flags to warning signs on tangents and flashing beacons to warning signs on curves.
- Warrants need to be met for application of certain countermeasures such as installation of new signals, stop signs, and left-turn channelization.

Each countermeasure is associated with a corresponding accident reduction factor. Accident reduction factors are a measure of the potential effectiveness of a particular countermeasure. (Actual factors used were based on the Kentucky Transportation Center's *Development of Accident Reduction Factors, Research Report, KTC-96-13.*) There are different ways in which accident reduction factors can be applied. Some reduction factors are broken out by accident severity, for example, property damage only, injury, or fatality. Some are broken out by accident type, for example, left-turn, right angle, nighttime. Some general reduction factors are applied to all accidents. In general, when both accident-specific reduction factors and general reduction factors were given for the same countermeasure, the accident-specific reduction factors were applied. This decision was made to avoid over estimation of potential accident reduction resulting from applying multiple general countermeasures addressing the same accident pattern. The accuracy of the predicted accident reduction is a combination of the selection of both appropriate countermeasures and appropriate reduction factors based on individual site circumstances.

Benefit/cost analysis
Once countermeasures were developed and potential accident reductions were calculated, a benefit-cost analysis was prepared for each location. The benefit/cost ratio accounts for economics and therefore is frequently used to prioritize safety improvements. This method was also used to prioritize the 1996 HAL and HARS projects.

Quantification of the benefit of accidents avoided was based on accident cost figures compiled by WSDOT and derived from national sources. The probable number of reduced accidents was multiplied by the estimated WSDOT accident cost and divided by three (corresponding to three years of accident data) to determine an annual benefit. Countermeasure benefits were converted to a present value normalized over 20 years to account for projects with different service lives.

Planning-level countermeasure cost estimates were developed for use in the benefit/ cost analysis. Since the cost estimates could not be based on an actual design, it was necessary to make general assumptions in determining total project costs. To help simplify the cost estimating process, some of the countermeasures and components of countermeasures were assigned lump sum costs.

The benefit/cost ratio is equal to the benefit of the probable accident reduction divided by the project cost. A benefit/cost ratio greater than 1 indicates the benefits of a proposed countermeasure are greater than the costs. For HALs, the benefit/cost ratio ranged from 0.1 to 76 with six countermeasures resulting in a benefit/cost ratio of less than 1.0. For HARSs, the benefit/cost ratio ranged from 0.1 to 211, with ten countermeasures resulting in a benefit/cost ratio less than 1.0.

The results of the benefit/cost analysis and detailed documentation of the process used are contained in the report, *High Accident Locations and Road Segments Analysis, King County, Washington*; Jacobs Civil Inc.; July 2003.

BRIDGE NEEDS

Assessment of bridge needs begins with inspection. The inspection system, which is based on the National Bridge Inspection Standards (NBIS), calculates a sufficiency rating based on such factors structural adequacy and safety, serviceability and functional obsolescence, and how essential the bridge is for public use. The rating ranges from zero (worst) to 100 (best). Under this system, all bridges having a sufficiency rating less than or equal to 50 are either functionally obsolete or structurally deficient and are equally eligible for federal replacement funds. Any bridge with a sufficiency rating less than or equal to 80 that is functionally obsolete or structurally deficient is also eligible for rehabilitation funds.

Sufficiency rating alone establishes eligibility for federal funding, but it is inadequate to prioritize bridges for replacement or rehabilitation. It does not give enough weight to important criteria such as load limitations, hydraulics, geometric deficiency, and expected useful life. The priority process establishes the need for individual bridge replacement by score and rank using criteria approved by the King County Council (Ord. 11693).

The bridge seismic study completed in 1994 ranks the relative need of seismic retrofits for each bridge included in the study. Bridges scheduled for replacement or rehabilitation within 10 years were excluded. The study assigned equal weights to four criteria: structural vulnerability, importance, seismicity, and life hazard. The final assessment of which bridges to retrofit

considers the potential for the bridge to become a viable replacement candidate and to be replaced within ten years. Consideration is given to such factors as whether the bridge provides a sole access and if the cost of the retrofit is a reasonable amount to invest for a limited period of protection prior to replacement.

Priority process rankings are used in the development of the annual six-year CIP. Highest priority projects are in the current CIP. Consideration for additions are guided by the following goals: add the highest priority bridges to the replacement program, continue with existing seismic retrofit program, establish a routine painting program, and provide for major maintenance and repairs that cannot be accomplished by Maintenance Operations.

The methodology for prioritizing bridge needs is documented in, "Proposed Prioritization Process for King County Bridge Needs," King County Department of Public Works, Roads and Engineering Division, July 1994 and "2002 Annual Bridge Report of the King County Department of Transportation, Road Services Division, Structural Design and Bridge Inspection Unit," April 2003.

SHORT-SPAN BRIDGE NEEDS

The Short-Span Bridge Program was started in 2006 to address the needs of short bridges nearing the end of their useful life. These bridges are less than twenty feet in length, and ineligible for federal or state bridge funds. The Road Services Division has identified over 50 bridges for this new program. The bridges have been inventoried and assigned a priority. It is expected that the bridge replacement program will last for a number of years, as several of the top ranked bridges will be will be implemented each year in a two year, design -- build schedule.

The priority array used for the Short-Span Bridge Program is the same priority array used for the other bridge needs.

ROADSIDE BARRIER (GUARDRAIL) NEEDS

The methodology for identifying and ranking potential sites for safety mitigation using roadside barriers, specifically guardrails and bridge rails, was revised in 2002-2003. The new methodology is quantitative and was used to develop priority arrays for each of three categories of barriers: new barriers, retrofits to existing barriers, and bridge rail upgrades.

The methodology has two principal considerations—risk potential and severity. The risk potential factor is a function of parameters that quantify the exposure and probability associated with vehicles running off the road. Severity is a function of parameters that quantify and rate personal injury potential. These factors were derived from current statistics and existing roadside features. Factors are based on accidents, average daily traffic (ADT), road functional classification, corridor geometry, bridge geometry, speed limit, need as defined by embankment

slopes, and roadside obstacles. The algorithms for retrofit barriers and bridge rail upgrades also incorporate parameters for existing barrier and rail deficiencies.

The primary source for establishing potential new barrier locations was the existing barrier priority array initially established in 1988. All locations remaining on the list were included in the array. In addition, a comprehensive roadside hazard inventory was completed for the King County arterial roadway system and analyzed to identify locations that might require barriers. Twenty-one sites were identified for further investigation. Additional non-arterial sites suggested by citizens and county employees were also included.

All sites with existing roadside barriers that are not compliant with standards were included as candidates for barrier retrofit. About have the existing barriers are non compliant and were therefore included as candidates. Risk exposure and degree of deficiency were the primary considerations in the prioritization process. Severity was less of a concern than for new barriers because it was assumed that all barrier locations were warranted.

All bridges and culvert crossings maintained by King County were included as candidates for bridge rail upgrades. Many of the candidate bridges were built prior to 1964 and do not have bridge railings designed to current safety standards. The bridge rail array identifies locations with safety deficiencies and prioritizes their upgrade. Three specific bridge deficiency and difficulty factors were established: structural deficiency, difficulty of upgrade, and end transition deficiency. In addition, a risk potential factor (average daily traffic) and a severity factor (posted speed limit) were included.

Priority arrays were developed for each of the three categories of barrier using the appropriate factors and algorithms. Each priority array was fully tested following development. Statistically valid sample sizes were developed for each array, and engineers field reviewed and ranked the sites. In each case, rankings correlated 90% or better with the results of the priority arrays.

Detailed documentation of priority array development and methodology is available in the document, *King County Roadside Barrier Program Priority Array Development;* September 2003; Jacobs Civil Inc., TransCore ITS, Inc., Garry Struthers Associates, Inc.; for King County Department of Transportation Traffic Engineering Section.

TRAFFIC SIGNAL PRIORITY PROCESS

The process to prioritize signals conforms to the laws set forth by the federal government, adopted with amendments by state government, and presented in the *Manual on Uniform Traffic Control Devices* (MUTCD) published by the Federal Highway Administration and the U.S. Department of Transportation. The prioritization process evaluates signal warrants (tests) set forth in the MUTCD and assigns rating values to each warrant. The rating values assign weights to the individual warrants. The sum of the individual warrant rating values provides a basis for comparison to other potential signal locations.

Prioritization and selection of intersections for signalization starts with data collection. Traffic Engineering staff members collect data on vehicle and pedestrian volumes, prevailing speeds, and accident history at each intersection over the most recent three-year period. Each intersection is then evaluated using MUTCD warrants based on the number of approach lanes and the collected data.

The MUTCD states that the signal warrants define the minimum conditions under which installing a traffic control signal might be justified. However, selection and use of traffic control signals should be based on careful analysis of traffic operations, pedestrian and bicyclist needs and other factors, coupled with engineering judgment. Traffic signals should not be installed unless one or more of the eight signal warrants is met. Three of these warrants are based on traffic volumes at several periods during the day: the peak hour, the fourth highest hour, and the eighth highest hour. Another warrant examines the traffic accident history, focusing attention of accidents correctable by signalization (left-turn and right-angle types). Two warrants examine pedestrian activity to determine if pedestrian volumes warrant signalization. The final two warrants examine whether signalization would improve traffic flow in a coordinated signal system or roadway network.

Four primary warrants are used in the evaluation of all intersections. The remaining warrants are most applicable to urban sites with frequent pedestrian activity. Such sites are less common in unincorporated King County.

The four primary warrants are:

1. Warrant #1 – Eight-Hour Vehicular Volume
   Condition A: Minimum Vehicular Volume
   Condition B: Interruption of Continuous Traffic
2. Warrant #2 – Four-Hour Vehicular Volume
3. Warrant #3 – Peak-Hour Vehicular Volume
4. Warrant #7 – Crash Experience

To the MUTCD warrants, King County adds a factor for proximity to school site. This additional factor does not replace the pedestrian-related warrants. For locations near schools, shopping, and other pedestrian attractors, the volume of pedestrian activity is examined as well as pedestrian warrants. The proximity to school factor addresses the potential for pedestrian activity outside the average-day activities.

Rating values representing the degree to which signal warrants are met are calculated for each warrant. Values are summed by intersection, and the list of intersections is sorted to separate those that meet signal warrants from those that do not. Intersections that meet warrants are sorted by rating value from the largest to the smallest and are then numbered according to their order in the list. The resulting list of rank-ordered intersections is commonly called the priority array. It provides a starting point for determining the locations to signalize.

Intersections on the top of the priority array undergo extensive evaluation of alternatives including existing and forecast traffic operational analyses to determine the effectiveness of each

alternative, turn pocket lengths, and cost comparisons. Alternative measures to signalization include, but are not limited to, the construction of additional lanes, revising the intersection geometrics to channelize movements, installing street lighting, improving sight distance, roundabouts, measures to reduce approach speeds, changing lane use assignments, restricting movements, adding stop controls or intersection flashers. Particular attention is given to the predominant type of accident recurring at the intersection. A committee of signal design and maintenance staff reviews the information developed from these analyses and selects the improvement providing the safest, most cost-effective, long-term solution.

Detailed documentation of the signal prioritization process is contained in the report, *King County Countywide Signal Program, Signal Priority Process*, King County Road Services Division, Traffic Engineering Section, July 2004.

PEDESTRIAN NEEDS

The Pedestrian Priority Process (PPP) focuses on improving the most critical pedestrian facilities in unincorporated King County. This process helps the County identify and prioritize pedestrian walkway improvements for construction. PPP was initiated in response to concerns expressed by the King County Council regarding pedestrian safety. The program uses a rating process developed in 1990-1991.

There are four main steps to the process:

Identification of Candidate Locations – A list of potential improvements is compiled from recommendations by Road Services Division personnel, business and community groups, and the general public.

Preliminary Screening and Scoping of Candidate Locations – Road Services Division employees field check each location to eliminate those that are not significant safety hazards or that are infeasible.

Determination of Priority Process Score – Potential improvements are rated based on the following eight evaluation criteria:

1. auto traffic volume (TV)
2. auto speed limits (Sp)
3. pedestrian volume (PV)
4. physical safety of existing pedestrian facilities (EF)
5. accident history (Ac)
6. appearance on other plans (Pl)
7. linkage to other pedestrian trails and pathways (L)
8. benefits to other travel modes: bicyclists, equestrians, bus riders, and the disabled (M)

Values for these criteria are used in the following formula to derive a total priority score:

2 x {(TV x Sp x PV x EF) + Ac} + Pl + L + M = Priority Score

Evaluation of Candidate Locations – Potential projects are reviewed. Low-scoring projects and those with prohibitive costs are given less consideration. The highest scoring projects are considered candidate projects for inclusion in the Road Services Division capital facilities plans.

Documentation of this process is contained in the report, *The Pedestrian Priority Process,* 1991, King County Roads and Engineering Division.

INTELLIGENT TRANSPORTATION SYSTEM (ITS) NEEDS

The corridor projects provide an overall ITS improvement program for key regional corridors. The key corridors were identified from the 2004 Transportation Needs Report (TNR) and from stakeholder feedback regarding transportation needs in unincorporated King County. ITS improvements proposed for the identified corridors include cameras, vehicle detection, traffic signal equipment and timing upgrades, pavement conditions sensors, and other devices where needs warrant, as well as communications infrastructure to support these devices. For the most part, these corridors are linked to each other or to other King County ITS projects, allowing for communications continuity and the establishment of a regional ITS corridor network. The corridors include both urban arterials and smaller-capacity rural roads.

A total of 34 corridor projects were identified. As with any planned improvement program, all of the projects cannot begin at once, and a prioritization process is needed to determine which projects best meet the needs of the County based upon their ability to meet key criteria. Criteria for analyzing the project priorities were established based upon examples from the 2004 Transportation Needs Report (TNR), as well as other criteria specific to ITS projects and the needs of the County. Each criterion was analyzed on a scale of 1 – 5 points; no single criterion was weighted more heavily than another. Priorities were established by totaling the points received by each project. A general priority level (Low, Medium, High) was then assigned by comparing the scores each project received.

It is recognized that actual project deployments are likely to be affected by such factors as funding availability and dependence on other projects, as well as require additional investigation into overall project feasibility. Therefore, the intent of the exercise was to provide a relative analysis of King County's ITS priorities, and not to establish a set order for deployment.

ITS Corridor Projects

The corridor projects include a broad cross-section of both urban and rural corridors, dispersed across the county. This section describes the process and criteria that was used to assign a relative (high, medium, low) priority to each project. These criteria were established with the purpose of providing a quantitative assessment of each project's alignment with King County needs and priorities. To the extent possible, the prioritization method was based upon criteria used in the 2004 TNR. The criteria include:

Average Daily Traffic (ADT): This criterion used the same traffic volume scale as capacity projects to assign priority to corridor projects along roads with the highest average daily traffic counts.

ADT Value	Score
>20,000	5
15,000 – 20,000	4
10,000 – 15,000	3
5,000 – 10,000	2
<5,000	1

Volume to Capacity Ratios: This criterion gave priority to roads whose volumes were approaching or exceeding capacity, based upon the following scale used in the TNR:

V/C Value	Score
> 1.2	5
1.0 – 1.2	4
.8 – 1.0	3
.6 -- .8	2
<.6	1

Accident Rates: Corridors with high accident rates were considered higher priority, using the following scale:

Accident Rate	Score
> 4.1	5
Below 4.0	4
Below 3.0	3
Below 2.0	2
Below 1.0	1

Transit Ridership: Corridors with greater volume of transit ridership were considered higher priority, using the following scale:

Average Weekday Ridership	Score
>400	5
300 – 400	4
200 – 300	3
100 – 200	2
1 -- 100	1

Potential for Annexation: Proposed and approved land annexations for 2004 and 2005 were reviewed as well as proposed future annexations. Corridors with little probability of annexation were considered higher priority using the following scale:

Proposed Annexation Year	Score
Rural	5
>2010	4
2009 – 2010	3

2007 – 2008	2
2005 -- 2006	1

Availability of Communications: Corridors with access to communications infrastructure were considered higher priority, using the following scale:

Communications	**Score**
King County fiber existing on corridor	5
King County or WSDOT fiber nearby	4
INET Hub Nearby	3
Other	2
None / Unknown	1

Links to Other Existing/Planned Projects: Higher priority was given to corridor projects that could coordinate or build off of other county ITS corridor projects, as follows:

Projects	**Score**
Links to Funded / Existing King County Corridor Project	5
Links to Other Strategic Plan Project	3

Hazard Areas: King County has identified a number of hazards along county roadways,including High Accident Road Segments (HARS), High Accident Locations (HAL), and areas prone to flooding, ice, and landslides. Corridors with two or more of these hazard locations were given a score of 5; corridors with one identified hazard were given a score of 3.

Hazard Areas	**Score**
Two or more hazards in corridor	5
One identified hazard in corridor	3

Final Priority Ranking

Total Corridor Priority	**Total Score**
High	Score > 23
Medium	Score 22 – 17
Low	Score <16

VULNERABLE ROAD SEGMENTS (VRS) STUDY

The Vulnerable Roadway Segments (VRS) study was instituted in 2005 to identify and address specific roadway funding needs throughout the County. A vulnerable road segment was defined as a road segment that requires abnormally expensive and/or frequent repairs. This includes roads with failing retaining walls, seawalls, roads with chronic settlement problems, or roadways close to rivers with repetitive erosion problems.

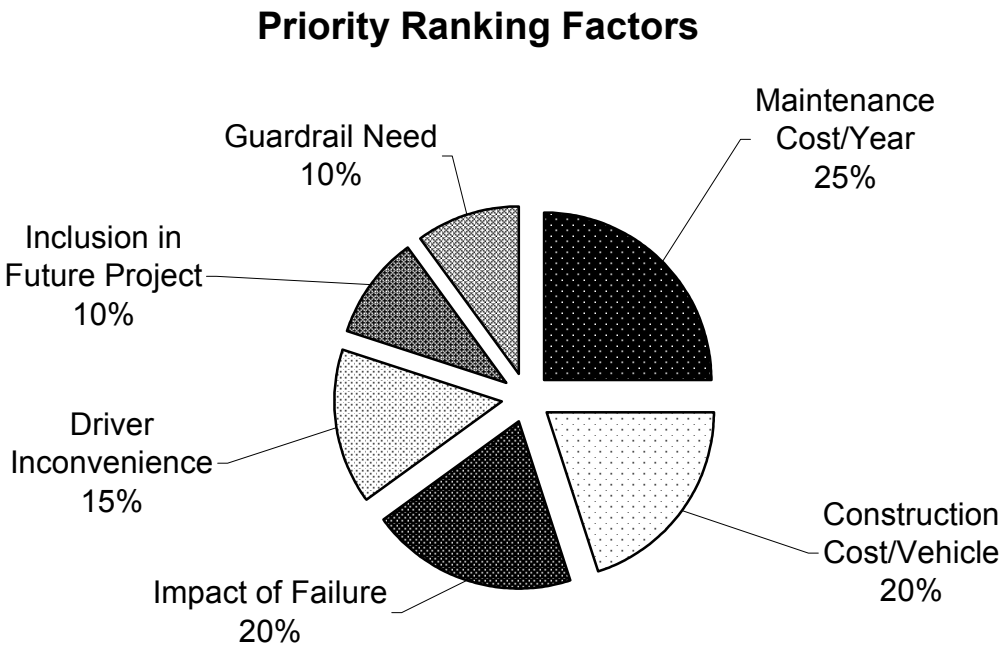
The first step of the study was to identify the vulnerable road segments throughout the County. The identification process consisted of a two-pronged effort; researching existing lists of

problem roads as well as finding new segments. The data collected from researching existing lists and working with the Road Services Division Maintenance Section provided enough information to start compiling a comprehensive list of the roadway segments found.

Priority Array Description

The factors shown in the pie chart below were used in developing the priority rank formula for vulnerable roadway segments. The value assigned to each of the factors was either calculated or collected from various data sources. The percentage of influence each category has in producing the priority rank is shown in the pie chart below.

The factors were chosen by the project team and refined through an iterative process. After each iteration, the values and percentages of the factors, as well as the segment rankings were studied for reasonableness. The overall goal was achieved when the full numerical range of each factor was well distributed among the segments and the weighting percentage of each factor seemed to result in a logical ranking of segments.



The Maintenance Cost / Year is the average estimated amount of money spent each year *repairing* the road segment to correct the identified problem in the short term. Projects with higher annual maintenance costs are given more priority.

$$Factor = \frac{M \times f}{20{,}000} \times 25$$

where M = estimated maintenance cost/year (in thousands of dollars)
f = the frequency of the maintenance each year
20,000 = the maximum maintenance cost/year
25 = the maximum number of points possible for this factor

The Construction Cost / Vehicle factor divides the cost of the *permanent* construction fix (i.e., not a maintenance repair) by the average daily number of vehicles that travel the road. Projects with a lower cost benefiting a higher number of vehicles are given a higher priority.

$$Factor = 20 - \frac{C / ADT}{1500} \times 20 \quad (Factor = 0 \text{ if formula results in negative value})$$

where C = *cost of permanent construction fix*
ADT = *average daily traffic count on segment*
1500 = highest C/ADT ratio, except for a few outliers (1500 chosen to keep this factor well distributed among segments)
20 = maximum number of points possible for this factor

The Impact of Failure factor accounts for the importance in correcting a vulnerable roadway segment. The project team made many field visits evaluating the majority of the vulnerable roadway segments, classifying the roadway problem, and performing a preliminary engineering assessment to score the roadway vulnerabilities. Each of the road segments was scored 1 to 5 addressing the predicted consequences if no action were taken to correct the problem. The scoring is as follows:

Score = 1 If problem is left uncorrected, total failure would likely occur, resulting in closure of the entire road.
Score = 2 If problem is left uncorrected, partial (or possibly total) failure of the road could occur, closing half (or all) of the road.
Score = 3 If problem is left uncorrected, partial failure of road could occur, closing a shoulder and/or possibly a lane of the road.
Score = 4 If problem is left uncorrected, minor loss of road function could occur in near future.
Score = 5 If problem is left uncorrected, maintenance would be necessary with no foreseeable loss of road function.

If Score = 1, Factor = 20	*Values of factors determined by an*
If Score = 2, Factor = 11	*exponential function (as opposed to a*
If Score = 3, Factor = 6	*linear function), to weigh full or partial*
If Score = 4, Factor = 3	*road closures much more heavily than a*
If Score = 5, Factor = 0	*minor loss of road function.*

The Driver Inconvenience factor of each road segment measures the overall level of driver inconvenience if a vulnerable road segment is closed. The detour length and the traffic volume on the segment is considered in this factor. Segments involving longer detours with higher traffic volumes are given more priority.

$$Factor = \frac{l \times ADT}{95{,}000} \times 15$$

where l = *length of detour caused by closed road segment*
ADT = *average daily traffic on segment*
95,000 = maximum l/ADT ratio (except for one outlier)
15 = maximum number of points possible for this factor

If a segment is part of a planned project in the CIP or TNR, the Inclusion in Future Project factor gives priority to such segments to account for the opportunity to complete two needs with one project.

Factor = 10 if segment included in other project
Factor = 0 if segment not included in other project

The Guardrail Need factor is a yes or no toggle identifying the need for guardrail on the vulnerable segment. Road segments slated for future guardrail projects are given more priority to account for the opportunity to fulfill two needs with one project.
Factor = 10 if guardrail is needed on segment
Factor = 0 if guardrail is not needed on segment
All of the priority ranking factors are then weighted to the percentages shown in the pie chart above and summed to produce a score between 0 and 100, ranking the different road segments and identifying the best project candidates. The road segments with the lower scores are the best candidates for road projects.

Sample calculation

The following sample calculation for vulnerable segment of NE Woodinville Duvall Road (steep slopes above and below roadway) will help illustrate how the final rating scores were calculated:

Maintenance Cost / Year (25 points max.)

$$Factor = \frac{M \times f}{20{,}000} \times 25$$ *= ($10,000 x 0.5 times/year) / 20,000 x 25 =* ***6***

Score is only 6 out of 25 due to relatively inexpensive repairs at infrequent frequency - once every two years.

Construction Cost / Vehicle (20 points max.)

$$Factor = 20 - \frac{C / ADT}{1500} \times 20$$ *= 20 – ($420,000 / 11,100 vehicles / day) / 1500 x 20 =* ***19***

Score is a high 19 out of 20 due to relatively inexpensive permanent fix for large volume of vehicles.

Impact of Failure (20 points max.)

If Score = 3, Factor = ***6***

Score is only 6 out of 20 due to lower impact of problem, which would close a shoulder of the segment, or one lane at worst. Traffic would not need to be detoured.

Driver Inconvenience (15 points max.)

$$Factor = \frac{l \times ADT}{95{,}000} \times 15$$ *= (8.5 mile detour x 11,100 vehicles / day) / 95,000 x 15 =* ***15***

Score is a full 15 out of 15 due to lengthy detour affecting a large volume of vehicles.

Inclusion in Future Project (10 points max.)

Factor = **10** (segment included in operational project identified in TNR)

Score is a full 10 points because it has also been identified as a need in another study.

Guardrail Need (10 points max.)

*Factor = **0** (guardrail is not needed on segment)*

Factor is zero since there is no need for guardrail on this segment, meaning two projects cannot be completed due to action on this segment.

Total Score

6 + 19 + 6 + 15 + 10 + 0 = 56

Total Rating (lower score is better candidate for action)

*100 – 56 = **44** (actually 43 due to rounding in spreadsheet)*

SMALL SCOPE OPERATIONAL PROJECTS

Program Description

Historically, small scope operational projects have been a lower consideration in the Road Services Division's CIP project development process, as these project are typically developed on an as-needed basis. In September 2005, the Division recognized the need to establish a program for these types of projects -- those that do not rate high enough to be funded from other prioritized program project lists. The goal for this program is to identify and support high benefit cost ratio projects that could address small scope traffic flow and safety issues. The focus of this effort is to develop a comprehensive list of pedestrian facilities, non-signal intersection improvements and roadway location projects with recommended improvements to serve unincorporated King County's transportation and pedestrian needs.

Program Development Process

As a new program and process, a statement of the programs goals and objectives was developed. A project recommendation and evaluation process was introduced that satisfied these goals and objectives. The project selection process used an objective methodology for ranking potential sites for safety and traffic improvements. Finally, a budget element was applied to make sure the most deserving projects are achieved first.

Goals and Objectives

The goal of this Small Scope Operational Program is to identify locations within unincorporated King County that could be enhanced by operational improvements, yet have not been implemented due to funding constraints. There are needs that have been identified for pedestrian facilities, non-signal intersection improvements and roadway locations that either do not fit the criteria of existing improvement programs or do not score high enough to be funded.. The objective of this program is to develop a prioritized list of small scale projects showing description of proposed work scope, limits and costs. Another common element of these projects

is their short design and construction schedules, which makes this program highly responsive to emerging needs.

Project Selection Process
The staff from the Road Services Division's Traffic Engineering Section developed a logical, project-selection process for identifying, selecting and prioritizing projects. There are four tiers to this process:

- Identification of a candidate project
- Preliminary screening and scoping of candidate locations
- Determination of priority process score
- Evaluations of candidate locations

Identification of Candidate Projects
A list of potential improvements is compiled from recommendations by a number of sources including KCDOT engineering staff, businesses, community groups, and members of the general public.

Preliminary Screening and Scoping of Candidate Locations
A field review was conducted for candidate projects for scope verification, cost estimating, and identification of unique constraints and challenges. Field trips were made to most sites to collect relevant, up-to-date field information, site-specific data, create site diagrams and sketches and take photographs. In addition, King County traffic volume and accident data was included as part of the location-specific analysis.

The evaluation for each project was based on a preliminary screening of the project information obtained during data collection. Preliminary screening/feasibility analysis was undertaken prior to project development to assure a candidate project is feasible and satisfies program goals and criteria before it is evaluated. As each project was screened, it was assigned a relative (high, medium, low) priority to develop a preliminary ranking and determination of whether to advance formal prioritization process.

Determination of Priority Process Score
The priority process was developed with the purpose of providing a quantitative assessment of each project's merits for comparison with similar projects. Prioritization and selection of projects begins with project screening/feasibility analysis and ends with the prioritized project list. Data on vehicle and pedestrian volumes, vehicle speeds, existing and planned facility capacities and accident history at each location over the most recent three or five year period was also collected as part of the analysis process.

Each project is unique due to the specific issues addressed. Certain concerns are indicative of site deficiencies that can be addressed by specific countermeasures. Countermeasures are the improvements that address problems at a given location to improve the safety or traffic

operations. Countermeasures at each location were developed for the three separate categories (pedestrian facilities, non-signal intersection improvements and roadway locations) based on the predominant problems, field observations, King County practices and standards, and the experience of the review team.

Pedestrian-oriented projects used the existing pedestrian priority array (see Pedestrian Priority Process earlier in this appendix). . The algorithm for non-signal intersection improvements and roadway location projects was developed specifically by the Traffic Engineering staff to score projects in these categories. The potential improvements for these projects were rated on the following criteria:

NON-SIGNAL INTERSECTION IMPROVEMENT PROJECTS

Volume to Capacity Ratio

Volume to Capacity Ratio	**Score**
Greater than 1.0	15
.5 to .99	10
.25 to .49	5
Less than .25	0

Volume to Capacity Ratio relative to number of hours it exceeds various thresholds

Volume to Capacity Ratio	**Score**
V/C > .8 for 8 + hours	10
V/C > .8 for 5 - 7 hours	7
V/C > .6 for 8 + hours	5
V/C > .6 for 7 hours or less	0

SAFETY CRITERIA

Accidents per million Entering vehicles -average of 5 most recent years (ACC/MEV)

Accidents / MEV	**Score**
Greater than 1.0	30
.5 to .99	25
.25 to .49	15
.10 to .24	10
Less than .10	0

SAFETY CRITERIA

Intersection Geometrics with respect to King County Road Standards-1993 for angle of intersection, horizontal curvature of approach, vertical curvature of approach, and stopping sight distance

Road Design Standards Met	**Score**
4 Criteria Not Met	30
3 Criteria Not Met	20
2 Criteria Not Met	15
1 Criteria Not Met	10
Meets KCRS Criteria	0

SAFETY CRITERIA
Speeding
85th Percentile Speed in excess of the posted speed limit

Speed greater than posted speed	Score
Greater than 10 MPH	15
7 MPH to 10 MPH	10
5 MPH to 7 MPH	5
Less than 5 MPH	0

ROADWAY LOCATIONS PROJECT CRITERIA

Level-0f-Service (congestion)

Level-of-Service	Score
A	0
B	0
C	5
D	15
E	20
F	25

SAFETY CRITERIA
Accidents per million vehicles (average of 5 most recent years)

Accidents per Million Vehicle miles traveled – 5 years	Score
Greater than 3.0	30
3.0 to 2.5	20
2.5 to 1.5	10
Less than 1.5	0

SAFETY CRITERIA
Roadway geometrics with respect to King County Road Standards 1993

Road Design Standards Met	Score
Meets none	30
Meets 1	25
Meets 2	15
Meets all	0

Speeding

Speed greater than posted speed	Score
Greater than 10 MPH	15
7 MPH to 10 MPH	10
5 MPH to 7 MPH	5

Less than 5 MPH	0

Evaluations of Candidate Locations

Scores for each location ranged from 0 to 100, with the following levels:

0 to 30	Low
31 to 50	Medium
51 to 100	High

Potential projects were reviewed with planning-level cost estimates and then subjected to a basic financial analysis. Low scoring projects or those with prohibitive costs are given less consideration. The highest scoring projects are prioritized and considered as best candidates for the Road Services Division's Small Scope Operational Projects program.

Project Selection

The small scope operational projects include a broad cross-section of both urban and rural locations, and priority arrays were developed for each of the three categories. The final project selection will be based on the priority scores weighted based on an assessment of each project's potential effectiveness. Consideration and higher priority was also given to such factors as whether the project could coordinate with or enhance other King County transportation needs and priorities.

Appendix D

Financial Analysis

Transportation Needs Report 2008
Executive Recommended Draft
March, 2008
Financial Forecast in Constant 2008 Dollars

	Road Fund	Fed BRAC	Federal	State	MPS	Other
2009	$40,368,551	$2,000,000	$2,500,000	$2,000,000	$1,500,000	$150,000
2010	$18,079,447	$1,500,000	$2,000,000	$1,350,000	$1,400,000	$150,000
2011	$28,274,647	$1,500,000	$2,000,000	$1,350,000	$1,300,000	$150,000
2012	$38,052,448	$1,500,000	$2,000,000	$1,350,000	$1,200,000	$150,000
2013	$39,057,131	$1,500,000	$2,000,000	$1,350,000	$1,100,000	$150,000
2014	$40,618,708	$1,500,000	$2,000,000	$1,350,000	$1,000,000	$150,000
2015	$40,750,559	$1,500,000	$2,000,000	$1,350,000	$900,000	$150,000
2016	$40,554,026	$1,500,000	$2,000,000	$1,350,000	$800,000	$150,000
2017	$40,352,910	$1,500,000	$2,000,000	$1,350,000	$700,000	$150,000
2018	$40,154,292	$1,500,000	$2,000,000	$1,350,000	$600,000	$150,000
2019	$39,955,830	$1,500,000	$2,000,000	$1,350,000	$500,000	$150,000
2020	$39,758,299	$1,500,000	$2,000,000	$1,350,000	$500,000	$150,000
2021	$39,562,031	$1,500,000	$2,000,000	$1,350,000	$500,000	$150,000
2022	$39,366,609	$1,500,000	$2,000,000	$1,350,000	$500,000	$150,000
	$524,905,488	**$21,500,000**	**$28,500,000**	**$19,550,000**	**$12,500,000**	**$2,100,000**
						$609,055,488

Amounts in Thousands of Dollars

	2008-2022 Needs	2008-2022 Allocation	
Bridge	$87,462	$61,000	
Capacity Major	$267,807	$110,500	
Capacity Minor	$167,593	$34,500	
ITS	$91,298	$18,000	
Nonmotorized	$168,103	$33,817	
Operations	$78,729	$23,500	
Preservation	$105,955	$59,000	
Reconstruction	$41,711	$21,000	
Safety	$78,392	$28,000	
Total	**$1,087,050**	**$389,317**	**$697,733 Shortfall**

Other CIP Needs	
Drainage/Fish Passage	$24,000
Environmental	$5,000
Overlay	$81,000
Misc	$11,000
Debt Service	$98,738
Total	**$219,738**